REPORT ON THE 1999 GROUND-PENTRATING RADAR INVESTIGATION: MT. MEAGER PUMICE DEPOSIT

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This report presents a summary of a geophysical investigation conducted by Golder Associates Ltd. (Golder) between September 16 and 19, 1999 on behalf of the owner, Great Pacific Pumice Inc. at the Mt. Meager Pumice Project site. The site is an operating open pit pumice mine located approximately 65 kilometres northwest of Pemberton on the North Slope of Plinth Peak at Mt. Meager. The main pumice deposit lies south of the Lillooet River, which over time has cut a 90 metre high, and 250 metre long bank at the bottom of the deposit. Ground Penetrating Radar (GPR) survey profiles were completed in the area of a planned new quarry on the west slope of the estimated 25 million cubic metre deposit.

The purpose of the investigation was to determine the minimum thickness of pumice across the proposed new quarry. The conventional approach used to evaluate the location and minimum depths of the pumice was an expensive drilling program. The purpose of the GPR survey was to provide an economical two-dimensional indication of the pumice distribution.

The survey area was mostly overgrown with thick vegetation; therefore survey lines were limited to road surfaces cut through the forest. Experience indicated that the pumice overlies a colluvial paleosol that developed during the Holocene, before the pumice eruption, approximately 2 350 years ago. The airfall pumice was deposited as a thick mantle on the existing topography, which in this area was a rock avalanche. Much of the pumice was deposited on the surface of the avalanche. Subsequent creep and sliding have resulted in development of small-scale lamination within the pumice. Overburden that developed on top of the pumice varies in thickness from a few decimetres to over a metre, depending on the surface slope and gravity driven accumulation/depletion.

The GPR method was selected for this investigation because dry, porous pumice would be relatively transparent to GPR whereas the underlying paleosol would be relatively reflective. In addition, GPR provides good vertical and lateral resolution of subsurface reflectors relative to most other techniques. Earlier, Dr. J.K. Russell from the University of British Columbia obtained trial GPR profiles at a nearby site with good results.

No boreholes have been drilled on the pumice fan, so calibration of the GPR traces against known stratigraphy was limited to exposures cut by the Lillooet River and those in the existing quarry. The main limitation to GPR in this environment is the possibility of clay-rich materials in the surface soils that could limit GPR penetration into the pumice deposit.

A total of 2410 line-metres of GPR data were collected, and the following general comments can be made about the acquired data and their interpretation:

- In essence, the GPR data quality is controlled less by depth of penetration than by clutter from within the pumice deposits, which is usually in the form of discontinuous reflections;
- The multiple reflections and scattering seen within the pumice deposit can be used to typify these materials, and to distinguish them from the underlying glacially-derived paleosols and local bedrock;
- The maximum penetration through the surface soils and pumice deposit was approximately 28 metres, as seen on lines immediately upslope from the pumice cut bank on the Lillooet River;
- The surficial soils layer limited penetration on portions of some lines;
- The paleosol surface underlying the pumice is generally apparent in most of the GPR profiles as a contiguous reflector layer. Above it there is a characteristic scatter of discontinuous reflectors that is identified as the pumice deposit.
- Interpretation of the GPR survey profiles was based on geophysical principles and experience, combined with stratigraphic exposures in the pit wall and riverbank, and the general geomorphology of the pumice deposit.

SUMMARY

GPR profiles revealed a series of undulating paleosurfaces with pumice thicknesses of up to 28 metres, perpendicular to the paleosurface slope. The overburden was variable in thickness (up to 2 metres) and moisture content in places was significant enough to block penetration of the GPR signal. The survey objective was met. Results were considered reliable by the owner, and their engineer used them to calculate a resource that exceeds 3.2 million cubic metres within the study area. From this data, the company completed a 20-year mine plan.